

WHAT IS CLAIMED IS:

1. An exposure apparatus comprising:
an illumination optical system for
5 illuminating a pattern of a reflection mask, by using
light from a light source, wherein said illumination
optical system includes:
a field stop that defines an illuminated
area on the reflection mask, and has an opening;
10 and
an imaging system for directing the
light from the opening in the field stop into the
reflection mask, the imaging system being a
coaxial optical system; and
15 a projection optical system for projecting
the pattern on the reflection mask onto a substrate,
wherein a principal ray of the imaging system at a side
of the reflection mask forming an inclination angle to
a common axis of the coaxial optical system, the
20 inclination angle being approximately equal to an angle
between a principal ray of said projection optical
system at the side of the reflection mask and a normal
to a surface of the reflection mask.
- 25 2. An exposure apparatus according to claim 1,
wherein said illumination optical system includes a
plane mirror for reflecting light from the imaging

system and for introducing the same into the reflection mask.

3. An exposure apparatus according to claim 1,
5 wherein the principal ray of the imaging system at a side of the field stop is approximately parallel to the common axis.

4. An exposure apparatus according to claim 1,
10 wherein said illumination optical system has an aperture stop at a pupil surface in the imaging system.

5. An exposure apparatus according to claim 4,
wherein the aperture stop has an opening, and said
15 illumination optical system has a mechanism for changing a size or a shape of the opening in the aperture stop.

6. An exposure apparatus according to claim 1,
20 wherein the field stop includes a masking blade that includes plural light-shielding plates.

7. An exposure apparatus according to claim 1,
wherein the field stop includes an arc slit that has an
25 arc opening.

8. An exposure apparatus according to claim 7,
wherein the arc opening has a curvature center on the
common axis.

5 9. An exposure apparatus according to claim 1,
wherein the field stop includes:

a masking blade that includes plural light-
shielding plates; and
an arc slit that has an arc opening.

10 10. An exposure apparatus according to claim 1,
wherein said illumination optical system includes:
a reflection integrator for forming plural
secondary light sources using the light from the light
15 source; and
a mirror system for superimposing light from
plural secondary light sources on the field stop and
for forming the arc illuminated area, wherein the arc
illuminated area has a curvature center on the common
20 axis.

11. An exposure apparatus according to claim 1,
wherein the imaging system includes four mirrors.

25 12. An exposure apparatus according to claim 11,
wherein first and fourth mirrors in the four mirrors
from the field stop have concave reflective surfaces.

13. An exposure apparatus according to claim 11,
wherein a third mirror in the four mirrors from the
field stop has a convex reflective surface.

5 14. An exposure apparatus according to claim 11,
wherein a second mirror in the four mirrors from the
field stop has a concave reflective surface.

10 15. An exposure apparatus according to claim 1,
wherein the imaging system has a pupil surface, and
includes a mirror that has a reflective surface at the
pupil surface.

15 16. An exposure apparatus according to claim 1,
wherein the light from the light source has a
wavelength of 200 nm or smaller.

20 17. An exposure apparatus according to claim 16,
wherein the light from the light source has a
wavelength between 5 nm and 20 nm.

18. A device fabricating method comprising the
steps of:

25 exposing an object using an exposure
apparatus; and

developing the exposed object,
wherein said exposure apparatus includes:

an illumination optical system for illuminating a pattern of a reflection mask, by using light from a light source, wherein said illumination optical system includes:

- 5 a field stop that defines an illuminated area on the reflection mask, and has an opening; and
- 10 an imaging system for directing the light from the opening in the field stop into the reflection mask, the imaging system being a coaxial optical system; and
- 15 a projection optical system for projecting the pattern on the reflection mask onto a substrate, wherein a principal ray of the imaging system at a side of the reflection mask forming an inclination angle to a common axis of the coaxial optical system, the inclination angle being approximately equal to an angle between a principal ray of said projection optical system at the side of the reflection mask and a normal 20 to a surface of the reflection mask.